$$\sum \frac{(x-1)^{2n-2}}{(2n-1)!}$$

$$\lim_{n\to\infty}\left|\frac{(x-1)^{2n}}{(2n+1)!}\cdot\frac{(2n-1)!}{(x-1)^{2n-2}}\right|$$

$$\lim_{n\to\infty}\frac{(x-1)^{2n-(2n-2)}\cdot\cancel{(2n-1)!}}{(2n+1)(2n)\cancel{(2n-1)\cdots 1}} = \lim_{n\to\infty}\frac{(x-1)^2}{(2n+1)2n} = 0<1$$

L

for all x

i.o.c. $= (-\infty,\infty)$ radius $= \infty$

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13. $$\sum_{n=1}^{\infty}\frac{n!}{2^n}x^{2n} = 0+0+0+0\ldots$$ if $x=0$

$$\lim_{n\to\infty}\left|\frac{(n+1)\cancel{n!}x^{\cancel{2n+2}\,2}}{2^{\cancel{n+1}}}\cdot\frac{\cancel{2^n}}{\cancel{n!}\,\cancel{x^{2n}}}\right| = \lim_{n\to\infty}\frac{n+1}{2}|x^2| = \infty$$

unless $x=0$

radius $=0$

i.o.c. : $x=0$

abs conv. $x=0$

conditional: no where

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56. $f(x) \approx P_4(x) = 7 - 3(x-4) + 5(x-4)^2 - 2(x-4)^3 + 6(x-4)^4$

$P_4(x) = f(4) + f'(4)(x-4) + \frac{f''(4)}{2}(x-4)^2 + \frac{f'''(4)}{3!}(x-4)^3 + \frac{f^{(4)}(4)}{4!}(x-4)^4$

a) $f(4) = ?$ 7

$f'''(4) = ?$ -12 $\qquad \frac{f'''(4)}{\cancel{3!}} = -2 \cdot 3!$

b) 2^{nd} order $f'(x) \approx -3 + 10(x-4) - 6(x-4)^2$

$f'(4.3) \approx -3 + 10(.3) - 6(.3)^2$

c) $\int_4^x f(t)\,dt = 7t - \frac{3}{2}(t-4)^2 + \frac{5}{3}(t-4)^3 - \frac{2}{4}(t-4)^4 \Big|_4^x$

$= 7x - \frac{3}{2}(x-4)^2 + \frac{5}{3}(x-4)^3 - \frac{1}{2}(x-4)^4 - 7 \cdot 4$

$= 7(x-4) - \frac{3}{2}(x-4)^2 + \frac{5}{3}(x-4)^3 - \frac{1}{2}(x-4)^4$

d) $f(3)$ exact

No, we can only approximate $f(3)$ using the power series

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33 $xe^{-x^2} = x - x^3 + \frac{x^5}{2} - \frac{x^7}{3!} + \frac{x^9}{4!} + \dots + \frac{(-1)^n x^{2n+1}}{n!}$

n starts at 0

$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{3!} + \frac{x^4}{4!} \cdots$

$e^{-x^2} = 1 - x^2 + \frac{x^4}{2} - \frac{x^6}{3!} + \frac{x^8}{4!} \cdots$

e^{2x+1}

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